

CLAIMS

1. A furnace comprising a heating unit, a furnace body that can degrease an article to be degreased by heating the article with the heating unit, and a treatment gas-introducing unit, the article being disposed in the furnace body and containing an organic substance,

wherein the furnace body includes an outlet for discharging a degreasing gas containing a small amount of gaseous oxygen and a large amount of gaseous organic decomposition products generated in an internal section of the furnace body during the degreasing of the article and also includes an inlet for receiving a dilution gas, from outside, for reducing the concentration of the gaseous organic decomposition products in the furnace body to prevent the explosion of the gaseous organic decomposition products;

the heating unit includes a first heater that can heat and degrease the article disposed in the furnace body and a second heater which heats the degreasing gas discharged from the outlet of the furnace body such that the gaseous organic decomposition products are removed and such that the degreasing gas is converted into a treatment gas containing a small amount of gaseous oxygen;

the treatment gas-introducing unit is used to introduce the treatment gas for dilution into the internal section of

the furnace body from the second heater through the inlet and/or the first heater; and

the treatment gas is introduced into the internal section of the furnace body from the inlet and/or the first heater in such a manner that the treatment gas is circulated through the internal section of the furnace body, the outlet, the second heater, the treatment gas-introducing unit, and the inlet and/or the first heater, whereby the concentration of the gaseous organic decomposition products in the internal section of the furnace body is reduced such that explosion is prevented, whereby the concentration of gaseous oxygen in the internal section of the furnace body is maintained low such that the article is prevented from being cracked due to the abnormal combustion of the gaseous organic decomposition products, and whereby the article can be degreased in a short time and then subjected to a subsequent firing step.

2. A furnace comprising a heating unit, a furnace body that can degrease an article to be degreased by heating the article with the heating unit, and a treatment gas-introducing unit, the article being disposed in the furnace body and containing an organic substance,

wherein the furnace body includes an outlet for discharging a degreasing gas containing a small amount of gaseous oxygen and a large amount of gaseous organic

decomposition products generated in an internal section of the furnace body during the degreasing of the article and also includes an inlet for receiving a dilution gas, from outside, for reducing the concentration of the gaseous organic decomposition products in the furnace body to prevent the explosion of the gaseous organic decomposition products;

the heating unit includes a third heater which heats the degreasing gas discharged from the outlet of the furnace body such that the gaseous organic decomposition products are removed and such that the degreasing gas is converted into a treatment gas containing a small amount of gaseous oxygen;

the treatment gas-introducing unit is used to introduce the treatment gas for dilution into the internal section of the furnace body from the third heater through the inlet; and

the treatment gas is introduced into the internal section of the furnace body from the inlet in such a manner that the treatment gas is circulated through the internal section of the furnace body, the outlet, the third heater, the treatment gas-introducing unit, and the inlet, whereby the concentration of the gaseous organic decomposition products in the internal section of the furnace body is reduced such that explosion is prevented, whereby the

concentration of gaseous oxygen in the internal section of the furnace body is maintained low such that the article is prevented from being cracked due to the abnormal combustion of the gaseous organic decomposition products, and whereby the article can be degreased in a short time and then subjected to a subsequent firing step.

3. The furnace according to Claim 1 or 2, further comprising a low-oxygen content gas-introducing unit for introducing a low-oxygen content gas, different in supply line from the treatment gas, into the internal section of the furnace body in addition to or instead of the treatment gas-introducing unit.

4. The furnace according to any one of Claims 1 to 3, wherein the organic substance contains at least one selected from the group consisting of polyvinyl alcohol, polyethylene glycol, starch, methylcellulose, carboxymethylcellulose, hydroxyethylcellulose, hydroxypropylmethylcellulose, polyethylene oxide, sodium polyacrylate, polyacrylamide, polyvinyl butyral, ethylcellulose, cellulose acetate, polyethylene, an ethylene-vinyl acetate copolymer, polypropylene, polystyrene, an acrylic resin, polyamide, glycerin, polyethylene glycol, and dibutyl phthalate.

5. The furnace according to any one of Claims 1 to 4, wherein the concentration of gaseous oxygen in the internal section of the furnace body is maintained at 0.5 to 17

volume percent using the treatment gas.

6. The furnace according to any one of Claims 1 to 5, wherein the first to third heaters are gas burners.

7. The furnace according to any one of Claims 1 to 6, wherein the treatment gas-introducing unit includes a sealed pipe for communicatively connecting the second or third heater to the furnace body.

8. The furnace according to any one of Claims 1 to 7, further comprising a heat-exchanging unit disposed between the second or third heater and the treatment gas-introducing unit and/or the low-oxygen content gas-introducing unit.

9. The furnace according to any one of Claims 1 to 8, wherein the article is porous and the percentage of the sum of the volumes of inflammable and/or non-volatile inorganic compounds remaining in the degreased article in the apparent volume of the degreased article $[(\text{the sum of the volumes of inflammable and/or non-volatile inorganic compounds remaining in the degreased article}) / (\text{the apparent volume of the degreased article}) \times 100]$ is preferably 5% to 60%.

10. A degreasing method comprising a step of degreasing an article to be degreased using a furnace including a heating unit, a furnace body, and a treatment gas-introducing unit by heating the article with the heating unit and a firing step subsequent to the degreasing step, the article being disposed in an internal section of the

furnace body and containing an organic substance,

wherein the furnace body includes an outlet for discharging a degreasing gas containing a small amount of gaseous oxygen and a large amount of gaseous organic decomposition products generated in the internal section of the furnace body during the degreasing of the article and also includes an inlet for receiving a dilution gas, from outside, for reducing the concentration of the gaseous organic decomposition products in the furnace body to prevent the explosion of the gaseous organic decomposition products; the heating unit includes a first heater that can heat and degrease the article disposed in the furnace body and a second heater which heats the degreasing gas discharged from the outlet of the furnace body such that the gaseous organic decomposition products are removed and such that the degreasing gas is converted into a treatment gas containing a small amount of gaseous oxygen; the treatment gas-introducing unit is used to introduce the treatment gas for dilution into the internal section of the furnace body from the second heater through the inlet and/or the first heater; and

the treatment gas is circulated through the internal section of the furnace body, the outlet, the second heater, the treatment gas-introducing unit, and the inlet and/or the first heater, whereby the concentration of the gaseous

organic decomposition products in the internal section of the furnace body is reduced such that explosion is prevented, whereby the concentration of gaseous oxygen in the internal section of the furnace body is maintained low such that the article is prevented from being cracked due to the abnormal combustion of the gaseous organic decomposition products, and whereby the article can be degreased in a short time and then subjected to the subsequent firing step.

11. The degreasing method according to Claim 10, wherein the treatment gas is circulated through the internal section of the furnace body, the outlet, the second heater, the treatment gas-introducing unit, and the inlet without operating the first heater.

12. A degreasing method comprising a step of degreasing an article to be degreased using a furnace including a heating unit, a furnace body, and a treatment gas-introducing unit by heating the article with the heating unit and a firing step subsequent to the degreasing step, the article being disposed in an internal section of the furnace body and containing an organic substance,

wherein the furnace body includes an outlet for discharging a degreasing gas containing a small amount of gaseous oxygen and a large amount of gaseous organic decomposition products generated in the internal section of the furnace body during the degreasing of the article and

also includes an inlet for receiving a dilution gas, from outside, for reducing the concentration of the gaseous organic decomposition products in the furnace body to prevent the explosion of the gaseous organic decomposition products; the heating unit includes a third heater which heats the degreasing gas discharged from the outlet of the furnace body such that the gaseous organic decomposition products are removed and such that the degreasing gas is converted into a treatment gas containing a small amount of gaseous oxygen; the treatment gas-introducing unit is used to introduce the treatment gas for dilution into the internal section of the furnace body from the third heater through the inlet; and

the treatment gas is circulated through the internal section of the furnace body, the outlet, the third heater, the treatment gas-introducing unit, and the inlet, whereby the concentration of the gaseous organic decomposition products in the internal section of the furnace body is reduced such that explosion is prevented, whereby the concentration of gaseous oxygen in the internal section of the furnace body is maintained low such that the article is prevented from being cracked due to the abnormal combustion of the gaseous organic decomposition products, and whereby the article can be degreased in a short time and then subjected to the subsequent firing step.

13. The degreasing method according to any one of Claims 10 to 12, further comprising a low-oxygen content gas-introducing unit for introducing a low-oxygen content gas, different in supply line from the treatment gas, into the internal section of the furnace body in addition to or instead of the treatment gas-introducing unit.

14. The degreasing method according to any one of Claims 10 to 13, wherein the organic substance contains at least one selected from the group consisting of polyvinyl alcohol, polyethylene glycol, starch, methylcellulose, carboxymethylcellulose, hydroxyethylcellulose, hydroxypropylmethylcellulose, polyethylene oxide, sodium polyacrylate, polyacrylamide, polyvinyl butyral, ethylcellulose, cellulose acetate, polyethylene, an ethylene-vinyl acetate copolymer, polypropylene, polystyrene, an acrylic resin, polyamide, glycerin, polyethylene glycol, and dibutyl phthalate.

15. The degreasing method according to any one of Claims 10 to 14, wherein the concentration of gaseous oxygen in the internal section of the furnace body is maintained at 0.5 to 17 volume percent using the treatment gas.

16. The degreasing method according to any one of Claims 10 to 15, wherein the first to third heaters are gas burners.

17. The degreasing method according to any one of Claims 10 to 16, wherein the treatment gas-introducing unit

includes a sealed pipe for communicatively connecting the second or third heater to the furnace body.

18. The degreasing method according to any one of Claims 10 to 17, further comprising a heat-exchanging unit and/or catalyst disposed between the second or third heater and the treatment gas-introducing unit and/or the low-oxygen content gas-introducing unit.

19. The degreasing method according to any one of Claims 10 to 18, wherein the article is porous and the percentage of the sum of the volumes of inflammable and/or non-volatile inorganic compounds remaining in the degreased article in the apparent volume of the degreased article [$(\text{the sum of the volumes of inflammable and/or non-volatile inorganic compounds remaining in the degreased article}) / (\text{the apparent volume of the degreased article}) \times 100$] is preferably 5% to 60%.